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ABSTRACT

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A solid freeform fabrication method and related apparatus for fabricating a three-dimensional, multi-material or multi-color object from successive layers of a primary body-building powder, at least a modifier powder and a binder powder in accordance with a computer-aided design of the object, the method including: (a) feeding a first layer of the primary body-building powder to a work surface; (b) operating an electrophotographic powder deposition device to create at least a modifier powder image and a binder powder image in accordance with this design; (c) transferring these powder images in a desired sequence to the first layer of a primary body-building powder; (d) applying energy sources to fuse the binder powder, forming a binder fluid that permeates through the first layer of a primary body-building powder for bonding and consolidating the powder particles to form a first cross-section of the object; (e) feeding a second layer of a primary body-building powder onto the first layer and repeating the operating, transferring, and applying steps to form a second cross-section (possibly of a different material composition distribution or color pattern) of the object; (f) repeating the feeding, operating, transferring, and applying steps to build successive layers of materials in a layer-wise fashion in accordance with the design for forming the multiple-layer, multi-material object; and (g) removing un-bonded powder particles, causing the 3-D object to appear.